

THE FOSSIL FLORA OF THE BOZEMAN COAL FIELD.*

BY F. H. KNOWLTON.

[Abstract.]

The first collection of fossil plants from what is now very generally known as the Bozeman Coal Field, Montana, was made in 1871 by the members of Dr. F. V. Hayden's party while they were encamped at Fort Ellis preparatory to beginning their memorable exploration of the Yellowstone National Park. The actual collecting was done by Dr. A. C. Peale, Mr. W. H. Holmes, and Mr. Joseph Savage, and the specimens were all obtained on the same day and from the same vicinity, although not all at exactly the same spot. As the country was at that time new and unsettled, the nearest fixed point was the military reservation of Fort Ellis, and the specimens were labeled by the various collectors as follows: "Six miles above Spring Cañon (now known as Rocky Cañon), near Fort Ellis, Montana;" "Above Spring Cañon, near Fort Ellis," and "Near Fort Ellis, above coal."

These specimens were identified by Prof. Leo Lesquereux, and represent about 30 species, nearly one-third of which were then regarded as new to science.

In recent years quite extensive additional collections have been made, both at the original localities and a number of newly discovered ones, by Dr. Peale, Mr. W. H. Weed, and myself. These, together with most of the original specimens that are fortunately preserved in the United States National Museum, have furnished the basis of the present examination.

As at present understood, the flora of the Bozeman Coal Field embraces 43 species. Of this number 3 are regarded as new to science, while a number of others are of exceptional biological interest.

Thinufeldia polymorpha Lx., sp., the *Salisburia polymorpha* Lx., of the original collection, is represented by a great number of finely preserved leaves, which are long, wedge-shaped in outline, narrowed from above the middle downward into a strong, thick petiole, and rounded, crenate or irregularly undulate or toothed at the apex. The nervation consists of a strong midvein, continuing to or vanishing just below the apex, and numerous thin,

* Read before the Biological Society of Washington, March 19, 1892.

close, simple veins emerging at an acute angle from it. Associated with these leaves were a small number of beautifully preserved leaves, representing an undescribed species of *Thinnfeldia*, which is long-lanceolate in outline, tapering gradually below into a thick petiole and above into a long, slender acuminate apex. The nervation is the same as in the preceding species. In the same beds with these leaves were found two fruiting catkins, at first thought to represent the fruit of the *Thinnfeldia*, but later decided to represent an undescribed species of *Populus*.

Perhaps the most interesting specimens are a number of ferns representing the fruiting condition of what has been called *Sphenopteris lakesii* Lx., one of the most characteristic species of the Denver formation of Colorado, but now shown to be an *Aspidium*. At least one-tenth of all the specimens in a very large collection of plants from the Denver formation belong to this *Aspidium lakesii* Lx. sp.*

The principal object of this investigation was to ascertain the light thrown by the plants upon the question of the age of the deposits. Lesquereux referred the plants to his Lower Lignitic or true Laramie.* On the other hand, Professor Ward would incline to place them in the Fort Union beds; but it is now known that he included in his enumeration localities in and about the Yellowstone Park which belong to a higher horizon than the Bozeman Coal Field.

Of the 43 species making up this flora, 3 are new to science and 9 others have never been found outside of these beds, leaving 31 species upon which we must depend in determining the age. Of this number 7 species, of which 3 are doubtful, have been found in the Fort Union beds, 14 in the undoubted Denver formation, 12 species at Carbon and Evanston, Wyoming, the age of which may be Denver, and 19 of the species in the true Laramie. By combining the species common to the undisputed Denver and the localities of Carbon and Evanston we have 19 species, or the same number as found in the true or coal-bearing Laramie. From this it appears that there can be no question but that it belongs to what is generally known as the Laramie, but the evidence of the fossil plants is hardly sufficient to permit a separation into the lower and upper divisions or the true Laramie and the recently differentiated Denver formation.

*All of the new or interesting species will be named, fully described, and illustrated in Bull. U. S. Geological Survey, No. —. In preparation.

*Hayden's Ann. Rept., 1872, p. 409.